TABLE 28
Primary Wildlife Species

Physiographic Province	Vegetative Zone [1]	Wildlife		
		Mammals	Bird Life	Amphibians and Reptiles
Olympic Peninsula	sitka spruce	black bear, black-tail deer, Roosevelt elk	Sharp-shinned & cooper's hawks, many song birds	western garter snake, Olympic salamander, tree frogs
	hemlock	black bear, black-tail deer, Roosevelt & Rocky Mt. elk	various hawks & grouse, many song birds	western garter snake, western spotted & tree frogs, Pacific salamander
	subalpine	black bear, Roosevelt & Rocky Mt. elk, black-tail & mule deer, beaver	various hawks & grouse, golden eagle, many song birds	tailed frog, long-toed salamander
Willapa Hills	sitka spruce	black bear, black-tail deer, Roosevelt elk	sharp-shinned & cooper's hawks, many song birds	western garter snake, Olympic salamander, tree frogs
	hemlock	black bear, black-tail deer, Roosevelt & Rocky Mt. elk	various hawks & grouse, many song birds	western garter snake, western spotted & tree frogs, Pacific salamander
Puget Sound Lowland	hemlock	black bear, black-tail deer, Roosevelt & Rocky Mt. elk	various hawks & grouse, many song birds	western garter snake, western spotted & tree frogs, Pacific salamander
Cascade Mountain Range	hemlock	black bear, black-tail deer, Roosevelt & Rocky Mt. elk	various hawks & grouse, many song birds	western garter snake, western spotted & tree frogs, Pacific salamander
	subalpine	black bear, Roosevelt & Rocky Mt. elk, black-tail & mule deer, beaver	various hawks & grouse, golden eagle, many song birds	tailed frog, long-toed salamander
	Douglas fir/ Grand fir	elk, mule deer, black bear	blue & ruffed grouse, several hawks	rubber boa, ringneck snake, long-toed salamander
	ponderosa pine/lodge-pole pine	elk, mule deer, coyote, porcupine	various hawks & grouse, steller's jay	sagebrush lizard, western skink, western whiptail, long-toed salamander
Okanogan Highlands	subalpine	black bear, Roosevelt & Rocky Mt. elk, black-tail & mule deer, beaver	various hawks & grouse, golden eagle, many song birds	tailed frog, long-toed salamander
	Douglas fir/ Grand fir	elk, mule deer, black bear	blue & ruffed grouse, several hawks	rubber boa, ringneck snake, long-toed salamander
	ponderosa pine/lodge-pole pine	elk, mule deer, coyote, porcupine	various hawks & grouse, steller's jay	sagebrush lizard, western skink, western whiptail, long-toed salamander
Blue Mountain	subalpine	black bear, Roosevelt & Rocky Mt. elk, black-tail & mule deer, beaver	various hawks & grouse, golden eagle, many song birds	tailed frog, long-toed salamander
	Douglas fir/ Grand fir	elk, mule deer, black bear	blue & ruffed grouse, several hawks	rubber boa, ringneck snake, long-toed salamander
	ponderosa pine/lodge-pole pine	elk, mule deer, coyote, porcupine	various hawks & grouse, steller's jay	sagebrush lizard, western skink, western whiptail, long-toed salamander
	ponderosa pine/ western juniper	mule deer, antelope, coyote	various hawks, pinion jay, Mt. bluebird	rattlesnake, sage-brush lizard, western toad
	sagebrush/ grass	pronghorn antelope, mule deer, jackrabbits, coyote	various hawks, bald eagle, prairie falcons	rattlesnake, horned lizard, sagebrush lizard
Columbia Basin	sagebrush/ grass	pronghorn antelope, mule deer, jackrabbits, coyote	various hawks, bald eagle, prairie falcons	rattlesnake, horned lizard, sagebrush lizard

Note: [1] For a description of the primary vegetative species in these vegetative zones, see **Table B-3** in Section 4 of Chapter A of this appendix.

Source: U.S. Forest Service, 1978.

As a general rule, all suitable habitats are fully occupied. A displaced animal must therefore displace another of its kind or perish. The second displaced animal must in turn displace another, and so on. As a result, when a plant community changes there inevitably is a loss of one or more members of animal species that depend on that habitat.

The amount of wildlife diversity is usually related to the transitional forest stages containing mixed stands of conifers, hardwoods, shrubs and herbaceous vegetation. Thus, shrub-seedling stage and the mature forest stage of succession generally contain greatest animal diversity.

Old growth is the final successional stage of a forest. It provides a specialized habitat, the components of which are important to many vertebrate species. Retaining some old growth and other specialized habitat acreage is necessary for maintaining diversity and stability within the ecosystem.

Wildlife typical of old growth forests are generally adapted to a closed canopy of coniferous species interspersed with small openings. Some species, including herbivores such as elk and deer, respond favorably to changes created by logging or fires, which allow development of a nutritious, nonconiferous vegetation in forest meadows. Other species, including some raptors (birds of prey) and large predators, use the forest openings as foraging area and the forest itself for seclusion. Accipiter hawks and horned and Northern Spotted Owls depend on birds and tree-dwelling mammals for their prey: the redbacked vole, flying squirrels and the small birds found in forested areas. Bald eagles and ospreys need trees near the water for nest sites; they prey principally on fish.

7.4.2.2 Habitat

The following general habitats are found on state forest land:

1. Habitat for Invertebrates

Invertebrates (insects, worms, etc.) are the most numerous animals in the forests, far outnumbering vertebrate animals in both terrestrial and aquatic environments. They comprise the majority of animal biomass in most terrestrial communities and are far more diverse than vertebrates. Invertebrates, especially insects, have great significance in the food chain as food for vertebrates. Insects can be grouped into two categories: subterranean and terrestrial (or above-ground) species. The subterranean species may live at least part of their life cycle underground (examples include termites and grasshoppers).

Terrestrial insects live on the ground, under rotting logs, in shrubs and in the forest canopy (examples include ants, wasps, flies and beetles).

The soil environment is one of intense microbial activity. Large numbers of soil flora and fauna exist on or below the forest floor, but are most abundant in upper soil layers. Many are so minute that they can be seen only with the aid of a microscope, though they play a vital role in many ecological processes important to higher life forms. These organisms are vital to the process of decomposing plant and animal residues. Microscopic forms such as bacteria, fungi, certain molds and algae predominate. They are extremely important in the decomposition of organic residues, the increase in available nutrients through oxidation, evolution of carbon dioxide and the symbiotic association with roots of trees and lesser vegetation.

Moisture, aeration, temperature, pH and organic matter are the most important factors that enhance microbial activity in the soil. These organisms commonly occur throughout each physiographic province and vegetative zone but are not distributed uniformly within soils. In general, they are not abundant in soils that are cold, poorly drained or low in organic matter, nor in strongly acid or highly alkaline soils.

2. Habitat for Aquatic Animals and Fish

Aquatic animals and fish respond to habitat conditions. Physical variables (such as width, depth, stream velocities, discharge rates, substrate, gradient and temperature) change continuously from highest intermittent headwater streams through estuaries, ponds and lakes. In this environment, aquatic plants provide food and cover for insects, other invertebrates, fish, waterfowl, furbearers, big game and nongame birds and animals.

These plants are a vital part of aquatic ecosystems; some of them grow in nearly all waters of the state, depending on suitable temperature, water depth and movement, available nutrients, salinity and light for photosynthesis. Most aquatic plants tend to grow in communities according to water depth, the major habitat requirement. Some plants occur in open water, while different species grow along the shores of lakes and banks of rivers (riparian vegetation).

Aquatic invertebrates are a major group of organisms that serve several purposes in the stream environment. The primary value of these species (mayflies, stone flies, caddis flies, etc.) is to process organic materials that fall into the stream. They capture and convert more than 70 percent of leaves and needles into usable nutrients.

Thus, the stream system acquires its energy from sun, soil, and plants. This system provides an essential link between terrestrial nutrients that enter the water and aquatic animals that need them.

Fish species can be generally grouped into three categories: 1) anadromous fish; 2) cold-water resident fish; and 3) warm-water game fish and nongame fish. Anadromous fish (salmon and trout) are primarily insect feeders. As they grow and become larger, they feed on a greater variety of organisms, including crustaceans, terrestrial insects that fall into streams and small fish. An abundant population of salmonid species therefore depends on a healthy food chain consisting of many small animals that feed on plants in the aquatic and riparian zones. Good water quality and habitat conditions are essential to maintain the food chain.

Cold-water game fish, such as trout, kokanee and whitefish, require colder water (below 70°F) and high water quality to maintain healthy populations. Warm-water game fish, such as bass and crappie, require warm temperatures (75° to 85°F) for reproduction. They are more tolerant of adverse habitat conditions than are salmon and trout.

Richness of fish species varies with stream size. In upper headwater streams, cutthroat trout are often the only salmonid fish, especially where barriers such as waterfalls or log jams prevent anadromous fishes from reaching these streams. In many cases, the introduced brook trout rather than cutthroat occupies headwater streams. Other fish are also found in headwater streams: sculpins, whitefish, Dolly Varden and bull trout. Below barriers, it is common to find anadromous salmonids -- seven species of salmon and steelhead -- as well as suckers, minnows and dace, sticklebacks, sturgeons and lampreys.

In the Cascade Mountains, streams frequently contain between three and five species. At lower elevations in Western Washington, streams often support one to three species, with increasing diversity in larger streams. Headwater fish depend upon both terrestrial and aquatic insects for food.

Many wildlife species rely on riparian areas for all or a major part of their lives. Riparian areas provide thermal and escape cover; they also serve as a major source of food and water. Large organic debris (LOD) -- usually fallen trees -- create riffles and pools in streams, and provide protection and habitat for fish. Riparian areas also provide travel corridors for wildlife.

3. Special Habitats and Features

There are numerous special habitats and features on state forest lands.

a. Old Growth Coniferous Forest

Old growth coniferous forests once occupied large expanses of the Pacific Northwest landscape. Since European settlement, the extent of these forests has been steadily reduced for agricultural conversion and timber production.

Scattered amounts of old growth occur on state forest land in widely-dispersed areas from the Columbia Gorge to the Canadian border, and from the east slope of the Cascades to the coastal plain on the Olympic Peninsula. Nearly all of these areas are closely juxtaposed with federally-managed lands (National Forests or National Parks) that have a much greater proportion of their land base in old growth.

Depletion of old growth forests is of concern because they harbor distinctive, if not unique, fauna. Many uncommon or rare animals find their optimal habitat in old growth, including goshawk, Northern Spotted Owl, Vaux's swift, white- headed and pileated woodpeckers, northern flying squirrel, marten, fisher and several species of bats.

Much of the distinctive nature of animal communities in old-growth forest relates to three, unique structural features: large live trees, large dead snags and large logs on land and in streams. These features usually occur rarely, if at all, in intensively-managed forests.

Research on wildlife and plant communities in Douglas-fir forests suggests several species of plants and animals appear to depend on old-growth forests for their viability. Other plants and animals are closely associated with old growth and would likely experience population declines in response to the loss of that habitat. Many of those species use one or more of the characteristic elements of old growth in their life cycles.

b. Dead and defective trees

Dead, dying and defective trees (reserve trees) are an important structural element of forest ecosystems in Washington. Approximately one-fifth of all Washington's wildlife species (86 species) use standing dead, dying and live defective tree habitat (snags). Many of these species are major predators of destructive forest insects. They depend on cavities in standing dead, dying and defective trees for nesting or denning.

Others wildlife species use down wood as a primary or secondary habitat component. They play a vital role in nutrient cycling and long-term productivity of the forest, add diversity to forest stands, and provide habitat for dependent and associated wildlife. Down logs also provide cover and travel routes for small mammals that eat and disperse mycorrhizal fungi. Logs also provide ideal sites for new fungus colonies. These fungi assist conifer trees in nutrient uptake and improve their growth. As the logs decay, they provide habitat conditions needed by invertebrates.

c. Oak Woodlands

Scattered woodlands dominated by Oregon white oak occur in the Puget Sound area and in the Southern Washington Cascades. They are most extensive in parts of Pierce, Thurston and Klickitat counties. Western gray squirrels are strongly associated with this species of flora. Many animals typical of other communities are also found there. Protection from wildfires since European settlement has greatly reduced this special community because Douglas-fir and other seral vegetative species have encroached on their habitat.

d. Riparian Areas

Riparian areas adjoin streams, lakes or wetlands. Although they comprise a small portion of the forest landscape, riparian areas receive disproportionately heavy use by wildlife for several reasons.

First, most terrestrial animals must enter riparian zones to obtain water, while many semiaquatic species (such as mink and wood duck) den and nest on land but rely on water for other habitat needs. Riparian zones thus satisfy needs of animals adapted to two different environments.

Of the 485 species of wildlife in terrestrial and shoreline habitats in Washington, about 290 (60%) are regularly found in riparian ecosystems. Some species are more dependent on riparian areas than others. A total of 68 species of mammals, birds, amphibians and reptiles were found to require riparian ecosystems to satisfy a vital life need during all or part of the year.

Some species, such as the spotted frog, aquatic beaver, muskrat and many waterfowl species are totally dependent upon riparian areas or wetlands.

The complexity of riparian vegetation also contributes to intensive wildlife use, including migration corridors. These areas provide nesting and feeding opportunities for a variety of animals, especially birds and bats. Vegetation provides cover for fish and other aquatic organisms, as well as birds, mammals, reptiles and amphibians.

In drier regions, riparian forests are heavily used by elk seeking cooler summer temperatures. They also serve as migration and dispersal routes for many kinds of animals. Because they are so attractive for many human uses as well (such as livestock grazing and recreation), these important wildlife habitats are particularly prone to disturbance.

e. Wetlands

Wetlands include marshes, swamps, bogs, fens and ponds. They support a distinctive group of animals and add an important element of diversity to surrounding forests. Typical vertebrates of marsh and swamp communities include the great blue heron, belted kingfisher, tree swallow, hairy woodpecker, muskrat and beaver.

Bogs are low-nutrient aquatic systems that have specialized plant and animal communities; they are sensitive to changes in nutrient levels or hydrology. Bogs frequently have diverse and abundant insect communities, and some of these insects are limited in distribution. One invertebrate, Beller's ground beetle, is found only in a few bogs in Western Washington. Other characteristic bog species include Townsend's vole and the common garter snake.

For many wetland inhabitants, the surrounding forest is an important part of their habitat. Some cavity-nesting ducks, for example, need large snags near wetlands to incubate and hatch their young. Beavers often travel far into the forest to find trees suitable for food and dam building. Interspersion of forest and wetland communities is thus a key to the presence of many animals.

The department estimates that between 13,000 and 48,000 acres of wetlands currently exist on state forest land in Western Washington. It is conducting an inventory of these lands to estimate more precisely the extent of this resource.

f. Cliffs, Talus and Caves. Cliffs, talus and caves are unique features of the forest environment. Like wetlands, they comprise a small part of the land base, though they support a variety of specialized animals. Cliffs, for example, provide nest and roost sites for swifts and many birds of prey.

Talus slopes are essential habitat to pikas, and support marmots, snakes, salamanders (including the Larch Mountain salamander) and other vertebrates. Caves are used by bats for roosting, raising young and hibernating. Adjoining forest communities provide food and resting places for animals using these special habitats. The way in which these forest communities are managed can therefore be expected to influence cliff, talus and cave-dwelling animals.

7.4.2.3 Endangered, Threatened and Sensitive Species of Fauna

The federal and state governments have listed several species of fauna as endangered or threatened. **Table 21** at page 87 contains the federal list of endangered and threatened species found on forested land in Washington State.

The complete federal listing of endangered and threatened species is contained in the Federal Register dated July 15, 1991 (50 CFR 17.11 and 17.12). The state listing is contained in the Washington Administrative Code (WAC 232-12-014).

1. Endangered Species

Of the animals listed as endangered, only the Columbian white-tailed deer is known to inhabit state forest land. Its habitat is now confined to a limited bottom-land area along the Columbia River in Wahkiakum County near Skamaokawa and on Puget Island, though occasionally a deer is observed at the mouth of Jim Crow Creek or the mouth of Grays River.

Three endangered animals in Washington (woodland caribou, peregrine falcon and gray wolf) may also inhabit state forest land. The peregrine falcon nests in a few cliff locations in Washington.

The Selkirk Mountains of northeast Washington, Idaho and British Columbia contain the only wild caribou in the continental United States: the woodland caribou. These animals occupy mature coniferous forests above 4,700 feet elevation which support arboreal lichens, the caribou's principal winter food. Continued viability of the Selkirk herd probably depends upon safeguarding their migration routes and mature forest winter ranges.

2. Threatened Species

Of the threatened species listed, the Northern Spotted Owl (Strix occidentalis) is the most prominent. Spotted owl nest sites are found in dense old growth timber, primarily in Western Washington. They require large expanses of timber for their habitat. Recent surveys have shown many individuals and nesting pairs of the Northern Spotted owl live on state forest land. The owl's recent listing as a threatened species has led the department to adopt measures to protect its habitat on state forest land. (See section 8.4.2.3, at pages 203-207.)

The bald eagle, another threatened species, is also known to inhabit state forest land. Eagle nests are usually found in large trees near water. Most nesting occurs in the San Juan Islands, the coastline of the Olympic Peninsula or the shoreline of Puget Sound. However, a few nest sites are inland near larger bodies of water, such as large lakes or major streams. The same nest may be used for years, with the birds simply adding to it each year. Often the same pair of eagles has two or more nests in the same area and will alternate between them from year to year.

The grizzly bear is not known to inhabit state forest lands. Grizzly bear habitat is confined mostly to federal land in northeast Washington. Some sightings, however, have been made in North Cascades Park.

The Oregon silverspot butterfly, also a threatened species, inhabits salt-spray meadows along the Washington and Oregon coast. It breeds and seeks shelter in adjoining Sitka spruce forests. There is only one known location in Washington; it is partially on state forest land.

3. Sensitive Species and Others of Concern

Several animal species generally considered candidate species for listing do not appear on the list in Table 21, though they do occur at least occasionally on state forest land. Although none is listed as endangered or threatened, the species are not abundant and are subject to depletion by habitat destruction or human harassment.

The Western pond turtle, for example, may occur on state forest land. Little is known about the ecology of this turtle. It may be vulnerable to habitat disturbance or chemical contamination.

Other species that fit this category are:

Golden eagle
Pacific giant salamander
Shorthead sculpin
Osprey
Cope's salamander
Bull trout
Herons
Olympic salamander
Dolly Varden
Tailed frog
Lake chub
Larch Mountain salamander
Olympic mudminnow
Brassy minnow
Northwestern salamander
Sandroller
Some species of dace
Long-toed salamander
Margined sculpin

Survival of these species may require protecting the habitats on which they depend. This responsibility is shared between the state Department of Wildlife (Nongame Program) and the department's Natural Heritage Program, which has developed a computer system to identify numbers, locations and protective status of endangered and threatened fauna in Washington.

In addition, the federal government and the American Fisheries Society have identified a list of depleted Pacific salmon and cutthroat stocks which they believe are at risk of extinction or of special concern. Several species in Washington are on the list. See "Pacific Salmon at the Crossroads: Stocks at Risk from California, Oregon, Idaho, and Washington," Fisheries Bulletin, Vol. 16, No. 2 (March-April 1991). Protective measures may affect department-managed land in some areas of the state.

7.4.2.4 Barriers and/or Corridors

Movement is essential for the survival and distribution of animals, and is typically governed by a range of physical adaptations and environmental conditions. Many mammals, for example, cannot cross high mountains; some will not voluntarily cross or enter areas that are not their habitat. Environmental conditions that block or restrict animal movement, occurrence or distribution are barriers; those that enable or enhance movement, occurrence or distribution are corridors.